THE ZOOLOGIST

No. 813.—March, 1909.

THE DARWINIAN THEORY IN 1867 AND NOW.

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On the 15th of March, 1867, a brief summary of Darwin's views on Evolution and of the antagonistic doctrines was given in a popular lecture to the Literary and Antiquarian Society of Perth. Very urgent occupations in other fields and perhaps a great disinclination to theorize have prevented further work in an area so fascinating and so fruitful to many. The lecture stands as it did in 1867, and in brackets a few paragraphs indicate, in the briefest possible manner, the general trend of facts and opinions on this and cognate subjects in recent times.

Two great views (not to mention minor ones) have agitated the scientific world on the question of the Origin of Species. Thus one group of naturalists holds that every animal and every plant was created as it is now seen, and that the progenitors in each case were in all respects identical with their descendants ; moreover, that where extinction has caused great blanks in the organic world a new creation has occurred on the ruins of the former epoch, the plants and animals of this new creation differing in specific characters from those of pre-existing forms. The followers of the second doctrine, again, assert that while creation of a few primary forms took place at some epoch, all the modern species of plants and animals are derived from these early progenitors by direct lineal descent with modification (the Darwin-Wallace theory). In the former case little or no variation of each original type is admitted; in the latter the power of variation is supposed to be very great.*

Thoughtful and experienced naturalists have long felt some difficulty with the question of the origin of the various species of plants and animals both fossil and recent. Such a question arises, for instance, in reflecting on the close affinity between the skeletons and soft parts of the various vertebrates. Lamarck was the first who hinted that they might all be produced by variation from a few ancestors. He reduced these ancestors, indeed, to two, the vibrio and the monad, and that these sprang from inorganic matter by spontaneous generation. On the one hand the development led through the annelids, cirripeds, and shell-fishes to fishes; and on the other—from the monad—through rotifers, polyps, starfishes, insects, spiders, and crabs. The class of fishes thus derived its several characters from transmuted squids and crabs. From the fishes the development proceeded through the well-defined vertebrate pattern up to man. Evolution further, according to Lamarck, depended on acquired characters. Buffon had previously advanced the opinion that man was one of the forms originally created, and that monkeys and the lower mammals were degenerated human beings. This, perhaps, was a more comfortable doctrine than that of the eccentric Lord Monboddo, who held, even before the time of Lamarck, that men were descended from the monkeys, that the ourang-outangs were members of the human species, and that in Bengal there existed human beings with tails. The list of authors who have enunciated more sober doctrines in relation to the development of existing from pre-existing species includes names very eminent in natural science, as well as the anonymous author [now known to be Dr. Robert Chambers] of the well-known 'Vestiges of Creation,' a work wherein what is called the progressive development theory is expounded. The author of the 'Vestiges' believed that all forms sprang from a single cell, and even this cell from inorganic matter, and that the several series of animated beings, from the simplest and oldest up to the highest and most recent, were, under the providence

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* The Darwin-Wallace communication "On the Tendency of Species to form Varieties; and on the Perpetuation of Varieties and Species by Natural Means of Selection" was made to the Linnean Society on July 1st, 1858.

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of God, the results, *first*, of an impulse which had been imparted to the forms of life, advancing them, by generation, through various grades up to the highest animals and plants ; and, *second*, of another impulse which tended to modify, in the course of generations, the organic structures in accordance with external circumstances. This work differs in many points from Darwin's, especially in regard to Mutation, though some arguments are common to both ; but these are wielded with much greater skill by the trained and philosophic naturalist.

In examining briefly some of the points brought forward by Darwin in support of his theory of the origin of species by means of what he calls "Natural Selection," one of the aims of this theory may be better understood by quoting the words used by a distinguished man of science, who put the saying of Lucretius in the mouth of a curious speculator or Darwinian interrogating a palæontologist. "You have," he says, "abandoned the belief in one primæval creation at one point of time ; you cannot assert that an Elephant existed when the first saurians roamed over earth and water. Without, then, in any way limiting Almighty power, if an Elephant were created without progenitors, the first Elephant must, in some way or other, have arrived physically on this earth. Whence did he come? Did he fall from the sky (*i. e.* the interplanetary space) ? Did he rise moulded out of an amorphous mass of earth or rock? Did he appear out of the cleft of a tree? If he had no antecedent progenitors, some such beginning must be assigned to him." Darwin and his followers assert that such an Elephant must have had ancestors.

[To-day the Darwinian might point to the discovery—in the Upper Eocene of the desert-region near the former Lake Meris—of an apparent ancestor of the Elephant, somewhat pig-like and smaller than a Horse, and to which the name *Meritherium* has been given by Andrews, its discoverer. Further, that a series of forms with long jaws from the same Fayûm (or desert-region) of Egypt, as well as the *Tetrabelodon* of the Miocene of France, lead to the condition in the American *Mastodon* in which the jaws are considerably shortened; and finally to the still shorter jaws of the modern Elephant with its "bull-dog" skull (Lankester).]

Darwin's whole theory being based on the mutability (adaptability) of species, and their derivation or development from primary forms, he puts aside the ordinary view of the independent creation of each organism, and proceeds to give his reasons for this conviction. Briefly stated, Darwin's Theory of Natural Selection supposes :—(1) That every kind of animal and plant tends to increase in number in a geometrical progression. (2) That each tends to transmit a general likeness with individual differences to its offspring. (3) Every individual may present minute variations of any kind and in any direction. (4) Past time has been practically indefinite. (5) Every individual has to endure a severe struggle for existence. (6) Every variety of a kind tending to save the life of the individual possessing it, or to enable it more surely to propagate, will in the long run be preserved. He first illustrates the variability of animals by appealing to what we find in domestic species. Every one is familiar with the numerous races of many domesticated animals, such as the horse, ox, sheep, dog, and pigeon, and moreover of the difficulty which one would have in saying whether a given race, say, of cattle, is merely a variety or a distinct species of cattle. Even Bacon long ago wrote in regard to variability by domestication : "By art also we make them greater and taller than their kind is"; "Also we make them differ in colour, shape, activity, many ways." The extraordinary variability, for example, of domestic pigeons is striking, for it is generally admitted that they are probably all derived from a single species of pigeon—the Rock-Pigeon (*Columba livia*). Anyone, even a naturalist, who for the first time surveys specimens so widely different as these varieties, would at once call each a separate species, and he might further group some under different genera ; that is, their distinctions are so great that there would be even more than specific divergence. It would, indeed, be hard to convince him that these were not produced originally from as many separate pairs of pigeons or species as there were varieties. Yet such cannot be the case, for, besides the statement previously made, only two or three other species of Rock-Pigeon exist, and these have none of the characters of the domestic breeds. That the numerous varieties of domestic pigeons are artificial productions, if the term may be used, their very curious structure of beak, feathers, and crop sufficiently testifies, for in no other group of pigeons is anything similar to be found. The fact also that occasionally a young pigeon (*e.g.* a tumbler) is produced with the white croup, double black wing-bar, and barred and white-edged tail-feathers—in short, in the very livery of the original Rock-Pigeon—is a very strong corroboration of its direct descent therefrom. No one will for a moment suppose, however, that these various breeds of pigeons have been solely produced by the modifying circumstances of habit and external conditions; on the contrary, it is at once perceived that they have been effected by the adaptation of man, who has sometimes had less a view to the creature's benefit than his own caprice.

It seems bold to emphasize this modification by man, yet some may be acquainted with facts that prove the occurrence of wonderful changes in this respect in a single race of cattle or sheep, even during a man's lifetime. The same is observed in the domestic fowls—which some suppose to have sprung from a single species—in horses, and in garden flowers and fruits. It is known that the cabbage, cauliflower, broccoli, kale, and kohlrabi are derivatives of one species, and rape or colza, turnip and probably ruta-baga (Swedish turnip) of another species. The late Hugh Miller, who was well known to have very strong antipathies to the development-theory (Darwin's in the present day), observes :—"Man is a mighty improver of creation. He adds to the beauty of the flowers which he takes under his charge, to the delicacy and fertility of the fruits; the seeds of the wild grasses become corn beneath his care; the green herbs grow great of root and bulb, or bulky and succulent of top and leaf; the wild produce of nature *sports* under his hand; the rose and the lily broaden their discs and multiply their petals; the harsh green crab swells out into a delicious golden-rhinded apple streaked with crimson." And so the udders of the cow and goat enlarge, the fleece of the sheep alters, and the cocoon of the silkworm becomes more bulky. The key to all this, says Darwin, is man's power of accumulative selection; Nature gives successive variations; man adds them up in certain directions useful to him or that satisfy his caprice.

In antagonism to the foregoing remarks, one of the most formidable of Darwin's opponents, the celebrated Prof. Louis Agassiz, of the United States, affirmed that Darwin had failed to establish a connection between the mode of raising domesticated races and the cause or causes to which wild animals owe their differences. He instanced the alternate generations of the sea-jellies, and the reproduction of the Salpæ, and added that there are far more astonishing phenomena than the slight differences produced by the intervention of man among domesticated animals, and which would shake their belief in such differences being trustworthy indications of the variability of species. Agassiz held that animals and plants could not have sprung from a single centre of creation, but were created where they now are; and with regard to each new species in successive strata, "Nature made him, and then broke the die."

[Since the publication of the 'Origin of Species' much has been done by Darwin and others at home, and much by the numerous band of Evolutionists abroad, to illustrate variation in animals. In Britain, Bateson held that variation—continuous and discontinuous—indeed, offered the best chance of explaining evolution, and his laborious work is well known. According to Galton great deviations are less common than slight deviations. The Mendelian theory, again, which has sprung into prominence lately chiefly by the labours of Bateson, is thought by some to be the theory which will solve the riddle of Evolution. Briefly, Mendel's law of inheritance in hybrid varieties holds that if a well-established form, with a definite character, *e.g.* size or colour, be crossed with another in which the character is different, the offspring will usually resemble one of the parents in the distinguishing character which is "dominant," the character remaining latent being "recessive." If the hybrids are crossed, the descendants will be of two kinds, some like the dominant, some like the recessive. When those like the recessive parent are crossed only recessives are bred. When those like the dominant parent are crossed the results are pure dominants, and apparent dominants, that is, with power to produce more pure dominants, more pure recessives, and more apparent dominants. The two characters do not combine in successive generations, and their antecedents occur in the germ-cells. More complex phenomena, however, occur in other cases, as *e.g.* in the breeding of fowls with single comb, rose-comb, and pea-comb. Thus when pea is crossed with single comb it acts as dominant. When pea is crossed with rose-comb an entirely new ("walnut") comb results, which has bristle-like hairs; the proportion of walnut, pea, and single by this mating being as 9 : 3 : 3 : 1. These complex phenomena are supposed to be due to compound allelomorphs in contrast with others in which simple allelomorphs only are present in the ova.* Selection, in certain cases, the Mendelians affirm, will never make a form breed true. Some Darwinians severely criticise the methods of the Mendelians and Mutationists in this country, and hint that instead of aiding in the work of elucidating evolution they appropriate much that is Weismann's and hinder progress.

Besides the foregoing much also has been observed and written concerning Heredity† since 1859, the problem being as to "How it is that a single germ-cell can produce, by repeated division, an organism in which the peculiarities of the somatic units of the parent are reproduced?" (Poulton). Among the most conspicuous efforts to solve it is Weismann's theory of "The Continuity of the Germ-Plasm," or the *blastogenic* theory, which is in contrast to the *somatogenic* or theory of *Pangenesis* of Darwin, in which every somatic cell is a germ-cell, the germ-cells proper being the central meeting-place.]

Darwin points out in the next place that variation occurs amongst animals and plants in a state of nature. One of the most remarkable of such variations is that recently described by Mr. Bates as occurring in the butterflies of the great Valley of the Amazon. He observed that a gregarious butterfly (one of the *Heliconidæ*) swarmed in incredible multitudes. In these swarms are to be found in small numbers other species of butterflies belonging to at least ten genera and some moths, and these intruders, though structurally different, mimic the members of the great group with which they associate so closely that it is a most difficult thing to distinguish them. That they are really intruders is shown by the fact that these mimickers depart from the usual colours of their genera. Moreover, they evidently do so to escape destruction by birds and other animals, for Mr. Bates found that the species of the large group which they mimic are seldom or never preyed on, as he thinks, on account of their offensive odour, and moreover that a knowledge of edible and inedible forms could be transmitted by heredity. Mr. Wallace, the author who conjointly propounded the theory of Evolution with Mr. Darwin, in the Linnean 'Journal' in 1858, has likewise described and figured similar variations in the females of certain butterflies in the Malayan Archipelago.* Darwin states that it is in the largest genera or groups that the variations are most marked, both in plants and animals, mainly because such afford a wider area for the action of the law.

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* *Vide* an interesting epitome of Mendelism by Mr. R. C. Punnett, 1905.

† *Vide* the excellent treatise on 'Heredity' by Prof. Arthur Thomson, 1908.

[Fritz Müller has given a different interpretation of this condition from that of Bates, for he thinks that the object of the mimicry is to reduce the danger from attacks of young and inexperienced enemies, which have to acquire the necessary knowledge. This author has further advanced an interesting series of facts in connection with the structure and development of the Crustacea, which he can only explain by Darwin's theory.] †

Prof. Louis Agassiz, on the other hand, maintained that all that can be proved is that there exists a considerable difference amongst individuals of one and the same species. Let anyone, he said, familiar with the fossil oxen and dogs compare them with the modern races of these genera, and he will find no correspondence whatever between them, for the simple reason that they do not owe their origin to the same causes. This author, however, advocated the specific distinctions of the various races of men, and was of opinion that they could not have all sprung from a single pair. He was supported by Dr. Hunt, who stated that there is as good reason for classifying the Negro as a distinct species as there is for making the ass a distinct species from the zebra; and if in classification intelligence is taken into consideration, there is a far greater difference between the Negro and the European than between the gorilla and the chimpanzee. Darwin's theory at least would give a single origin to man, while that of the foregoing authors who adhere so much to the original and independent doctrine of Creation assigns a multiple origin to man.

Some, like the Duke of Argyll, affirm that many structures (*e.g.* the feathers of the Humming-bird) have been created for beauty,* and have not been developed by variation, but Darwin says with force that the idea of beauty obviously depends on the mind of man; thus neither the Negro nor the Chinese admires the Caucasian *beau ideal* of a woman. Were the volute and cone shells, he asks, of the Eocene created to be admired in man's cabinet? He further explains that the beauty of many flowers is a provision for attracting insects in order to scatter the pollen, and the attractive delicacy of some fruits, such as the cherry and strawberry, is a lure for birds to swallow them and so spread abroad their seeds.

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* And previously about new species (Ann. Nat. Hist. 2nd ser. vol. xvi. p. 184, 1855).

† See also Wallace on 'Natural Selection,' 1870 (Macmillan & Co.).

One of Darwin's reviewers, said to be Prof. Owen, in commenting on the statement that it is in the largest genera that the widest limits to the species and the most extensive variation are found, brings forward the counter-statement that the Elephant is a small genus, comprising only two species, yet the range of both Indian and African examples is considerable. The Borneo Pongo (or Orang) consists likewise of but one species, which varies much. On the other hand, the species of the Antelope "genus" have not hitherto presented noteworthy variations; yet the "genus" in respect to number of species is one of the largest in the mammalian class.

Darwin supposes that those variations which are profitable to the individual of any species, in its complex relations to other organic beings, will tend to the preservation of the individual, and will generally be inherited by its offspring. In the struggle for existence which all animals, not excepting man, are constantly engaged in (and perhaps, it has been truly said, the nearer the kindred the more internecine), such modified descendants will have a much better chance of surviving than those not so favoured, and the latter will die out. Now comes into play Darwin's great talisman, "Natural Selection," or the preservation of favourable and the rejection of injurious variations either in plants or animals. Since many more individuals are born than can possibly survive, those individuals and those variations which possess any advantage, however slight, over the rest are in the long run sure to survive, to propagate, and to occupy the field, to the exclusion or destruction of their weaker brethren. It elucidates, says Prof. Asa Gray, the advantages of good breeding, and makes the most "of every creature's best."

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* 'Reign of Law.'

As an illustration of this law of Natural Selection, suppose, says Darwin, that all the rabbits of a country were to perish, so that the dogs and foxes required to subsist solely on hares. It is evident that the longest limbed, most agile, and swiftest of these predatory animals would be most successful in gaining food in times of scarcity, and would rear most young, which would tend to inherit such advantages; while the less agile would perish. And so with any animal which depended on its speed, strength, weapons of offence and defence, either in regard to obtaining food, or superiority in combat between males.

[Another theory subsequently broached by Darwin and elaborated at considerable length is that many of the variations are due to the selective power of the animals themselves. Thus female birds (which are generally clad in sober colours) choose for mates the finest and most perfectly coloured males. The strongest and most courageous males amongst deer and other animals drive off their weaker brethren and select their partners. Thus it is, he states, that special developments, such as horny or warty appendages, the perfume of the Musk-deer, tufts, beards and moustaches of men and the apes, are to be accounted for.

Mr. Wallace,* again, objects to Darwin's views on this head, and holds that the colours of animals are not due to such selection, which the more potent influence of Natural Selection would neutralize. Mr. Wallace also holds that the latter will not account for the condition of man.]

Every organic being is striving to increase to its utmost, but there are various checks which tend to keep each within due limits, such as the supply of food, the climate, and seasons of extreme cold or drought. In the years 1826 to 1828 this was well shown in La Plata, where from great drought most of the cattle died, and the country everywhere swarmed with mice. The latter disappeared on the advent of moist weather. Again, where there is abundance of food and no great check some animals increase extraordinarily—for example, the Passenger Pigeon and the Fulmar Petrel—yet the latter lays only one egg.

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* 'Tropical Nature,' p. 211, &c., 1878.

Darwin states there is little doubt that the stock of partridges, grouse, and hares on any large estate depends chiefly on the destruction of vermin, though others might also suggest that the amount of protection is important. Thus the Malthusian doctrine—that population, if left to itself, increases at something like a geometrical progression, while the means of sustenance from the fertility of the land and bringing in waste only increases at something like an arithmetical progression—suits well with the Darwinian theory, and, like it, requires the agency of checks. The lucky and the strong must prevail, or multiply and vary, while the weaker and ill-favoured perish.

[No more striking instance of the feature alluded to by Darwin could be mentioned than the introduction of rabbits into Australia. The same may be said of the Voles (*Arvicola agrestis*) of our own country, which occasionally appear in incredible numbers in woods, and do great damage to trees and shrubs both above and below ground. The plan of sheltering young trees and shrubs in exposed situations by permitting the grass to grow around them prevents the owls and hawks from preying so readily on the Voles, and thus aids in keeping up their numbers.]

His opponents, however, instance the fact that according to the rate of modification experimentally proved in regard to domestic pigeons, we ought to find evidence of progressive increase, for example, in the combative qualities of the antlers in those deer that for centuries have fought and bred in the mountain wilds of Scotland. Such is found not to be the case on comparing modern antlers with the most ancient ones from submerged forest lands. Cuvier, too, proved that no change of specific characters had occurred in the ibis, cat, and crocodile found in the tombs of Egypt, and ranging back three, four, or five thousand years ago. Moreover, Agassiz adduces the evidence that the coral polyps engaged at present in constructing the reefs on the coast of Florida have been engaged there for thirty thousand years at least, and all this time no change has ensued in their specific characters. Darwin gets over this difficulty by saying that it is not necessary that every species should vary, but only some, and that only occasionally.

There are others, again, who object to the notion that any being is placed under unfavourable conditions by the Creator, and roundly charge his whole theory with atheism. One of his supporters, Prof. Asa Gray, quaintly asks: "Are not many individuals and some races of men placed by the Creator under unfavourable circumstances, at least under such as might be advantageously modified?"

[Thus *Sphex* (a hymenopterous insect like a wasp) stings caterpillars and spiders through the nervous system, so that they continue to live and afford food for its larvæ in their cells. Another hymenopterous insect, *Polynema*, deposits its eggs in those of a dragonfly (*Agrion virgo*), and these are developed at the expense of the latter, which serves as a store of food-yolk. Such instances sufficiently illustrate the unfortunate conditions of certain types under natural conditions, and the same is seen in the white pigs of Virginia, which are poisoned by the paint-root (*Lachnanthes*), whilst black pigs escape.

Again, conscientious adherents of the Church, such as George Henslow, have striven to show that the very same laws of Evolution equally regulate the growth of Religion, whether in the Individual, the Church, or the Nation. Wasmann, in Germany, adopts similar views as to the evolution of animals, but he excepts man, who has an immortal soul, and has a totally different origin from them.]

Darwin believes that this law of Natural Selection, for instance, keeps the colour of certain birds, when once acquired, true and constant; for if any one was produced with a colour different, say, from the usual hue of a Grouse, hawks would very easily observe it. A white Pigeon in a flock of blue Rocks has a greater chance of being struck by a hawk, and a white wild rabbit is perhaps a conspicuous lure for a fox.

Natural Selection always acts slowly, and its action depends on the occurrence in nature of certain places which can be better filled through some of the inhabitants of the country undergoing modification of one kind or other. The favoured races supersede those which are not modified, just as we see breeds of cattle and sheep and varieties of flowers taking the places of older and inferior kinds.

[Yet in this connection nothing is more remarkable than the persistence of the food-fishes in the ocean. For ages they have been harassed by every nation bordering on the sea, and by each succeeding generation in an ever-increasing degree. Nevertheless, no serious diminution in their numbers has yet been proved, even though the great array of international workers have been striving to this end. Everything in their mode of reproduction and in their surroundings is so advantageous to their safety and endurance. No less striking is the fact that, though the pelagic eggs and sperms of several species commingle in the ocean, no crossing occurs.]

Pictet, the celebrated palæontologist, of Geneva, allows that species are not immutable in modern times, but demurs to having the principle much extended. The law of extinction of certain types is also admitted by most naturalists, though adverse to this theory of Darwin's. Professor Owen, for example, mentions a remarkable instance of gradual extinction in modern times in the case of the Great Auk, which has not been specially hunted down like the Dodo, but by degrees has become more and more scarce. The influence of man also not unfrequently causes extinction; thus the Dodo, a large bird allied to the Pigeons, once inhabiting the Mauritius, *Rhytina stelleri*, a kind of Manatee formerly abounding on the coasts at Behring's Strait, the Capercailzie* in Britain, and probably also the Irish Elk, are examples that have become extinct more or less through man's agency. Even now there are species whose numbers are daily diminishing under the same hand, *viz.* the Wapiti or Canadian Deer, the Ibex of the Alps, the Bearded Vulture, the Bison, Beaver, and Wild Turkey.

This "Natural Selection," say his opponents, rests on a purely conjectural basis. They bring forward the remarkable case of alternation of generation in *Campanularia*, which produces a bell-shaped Medusa or jelly-fish, from the eggs of which the hydroid stock arises, and ask in such a case, "Have the parent forms become extinct?" Cuvier also, while admitting variation, affirmed that the capacity to vary proceeds only to a certain point.

Admitting that structure, instinct, and habit vary, it may be asked, Why do they vary together and harmoniously instead of vaguely? The Darwinians allow they cannot tell. The opponent goes on to illustrate his principle. Now suppose, for instance, the gills of an aquatic animal converted into lungs, while instinct compelled a continuance under water, would not drowning ensue? No doubt, answers the Darwinian; yet we see that young Frogs do not keep their heads under water after ceasing to be tadpoles. The case of the Climbing Perch (*Anabas scandens*) also seems adverse to Darwin's theory.

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* Now reintroduced.

Darwin lays hold of the Lamarckian doctrine of use and disuse, and shows how certain birds (as the Apteryx and Ostrich) may have by Natural Selection lost the use of their wings as organs of flight. He further treats of the curious instances in which distinct species present analogous variations, and where a variety often assumes some of the characters of an allied species, or reverts to some of the characters of an early progenitor. This is seen in the tendencies of some domestic Pigeons to assume the bluish colour and characteristic marks of the original Rock-Pigeon. The whelp of the Lion sometimes presents stripes, and in like manner the young of the Puma, Tapir, and Wild Pig, and the young of the Blackbird are all speckled. He also illustrates this subject by referring to the occasional presence of stripes on the legs of the various species of the Horse genus (such as the Ass, Mule, Quagga), like those on the Zebra, or stripes on the shoulder, as in the Ass; and by comparing his examples with the analogous case of the domestic Pigeons he comes to the following conclusion:—"For myself, I venture confidently to look back thousands on thousands of generations, and I see an animal striped like a Zebra, but perhaps otherwise very differently constituted, the common parent of our domestic Horse (whether or not it be descended from one or more wild stocks), of the Ass, the Hemionus, Quagga, and Zebra."

He sees no difficulty in Natural Selection forming the expanded membrane of the Flying Lemurs and Squirrels, but he makes no mention of the Flying Dragon. The flank-membranes of the former are stretched out by the limbs, while the latter has its membrane on its ribs (six). So complex an organ as the eye is accounted for by this Natural Selection and gradual development. "In living bodies variation will cause slight alterations, generation will multiply them almost infinitely, and Natural Selection will pick out with unerring skill each improvement. Let this process," says Darwin, "go on for millions and millions of years, and during each year on millions of individuals of many kinds; may we not believe that a living optical instrument might be thus formed as superior to one of glass as the works of the Creator are to those of man?"

His opponents instance the case of the Trilobites, which occur in the lowest fossiliferous rocks, and show how complex their eyes are (each having from four hundred to six thousand facets), while the time for developing these intricate organs is supposed to be limited. [Now, however, this time has been greatly extended, even to five hundred millions of years as the age of the earth.]

Darwin observes that where the habits and structure of an animal are not in agreement, the apparent anomaly can only be explained by its struggle for existence, it having been beaten off its natural ground and forced to seek subsistence elsewhere. Thus it is why Grebes, Coots, and Waterhens, all eminently aquatic in their habits, have imperfectly webbed feet—indeed, the latter not at all; why the Landrail which closely resembles the Waterhen is almost as terrestrial as the Partridge. So when winter shuts out with its barriers of ice the *Mustela vison* (an animal much resembling an Otter), which all summer has preyed on fish by diving, it leaves the frozen water in its struggle for existence and preys, like a Polecat, on mice and land animals.*

Darwin cautions his objectors as to the fallacy of rashly concluding that this or that organ could not have been formed by transitional gradations of some kind, and adduces in support of his position the fact that the alimentary canal of the larva of the dragonfly and the fish *Cobites* (a kind of Loach) acts the part of a lung, stomach, and intestines. The Common Hydra may be turned inside out, and what before acted as skin now acts as stomach and the stomach acts as skin.† Again, it might be supposed that the head of the Vulture was made naked for the purpose of feeding on putrid flesh, yet the head of the clean-feeding Turkey is similarly naked. It might be held that the tail of the tadpole was given to it for swimming, yet the tadpoles of the Surinam Toads, which never enter the water, have a similar tail.

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* Change of habits is seen also in the Tyrant Flycatcher, hovering like a hawk and plunging into water for fishes; in the Black Bear, swimming on the surface of the water with widely open mouth catching insects like a Whale; and in the case of Baker and his German's Donkey, which, when hunting in the Basé Country, fed on the flesh of Antelopes, and throve exceedingly. In the same way the Zetlandic cattle acquire a fondness for dried fishes.

† This is now interpreted differently.

In treating of instinct he has to make remarkable admissions with regard to the slave-making ants. He accounts for the habits of the Cuckoo also by Natural Selection. The American Cuckoo builds a nest and sits on its eggs. Suppose that at one time the European Cuckoo had the same habit, but that occasionally it laid an egg in another bird's nest. If the old bird profited by this means and was enabled to migrate earlier, or the young birds were made more vigorous, then the old birds or young would gain an advantage. The young would be apt to follow by inheritance the habit of the parent, and lay eggs in other birds' nests, and so on by degrees until we have the present condition. This habit of laying eggs in other birds' nests is seen in the case of the Guinea-fowl depositing eggs in Partridges' nests, and Pheasants and Greyhens in each other's nests.

The want of evidence in ancient times of the fossil connecting links between Darwin's original species and their present descendants he lays solely at the door of the imperfection of the geological records. He affirms that it is only during subsidence of the sea-bottom that our great geological deposits rich in fossils have been formed. Moreover, he points out that we would not expect to find the missing links intermediate between any two given species, but between each and a common progenitor, *e. g.* the Pouter and Fantail are both derived from the Rock-Pigeon; if all the intermediate varieties existed there would be a close series between each and the Rock-Pigeon, but *none* intermediate between the Pouter and Fantail.

He shows how little of the surface of the world has been minutely explored for fossils, and how closely consecutive formations are related to each other in their fossil remains as compared with the formations more distant from each other in time. One of his supporters, in criticising Agassiz's views in regard to prophetic types (that is, the combination in an animal of structural peculiarities which at later periods are only observed separately in different animals, *e.g.* Pterodactyles and birds—*Ichthyosauri* and *Cetacea**)—says that this is just what we would expect, for, to take the *Ichthyosauri*, for example, it is apparent that by Natural Selection and divergent variation they were resolved into common fishes and Saurian reptiles, the intermediate grades being extinguished in the struggle for existence which ensued between the various species.

[Poulton thinks that in the case of the large mammals preceding those which gave rise to the quadrupeds now upon the earth, the small brains of the former were conspicuous, and he thinks they were worsted by animals which were in other respects no better endowed. In the same way the gigantic reptiles of the Secondary Period were at a disadvantage with the mammals of the Tertiary. Moreover, that Natural Selection does not account for the beginning of things, and that therefore organs are formed by the modification of pre-existing organs.]

Darwin's drawing on the imperfection of the geological record is met by the objection that our only ground for prophesying what may come from such sources is by the analogy of what has come to light. It is known that the last *Ichthyosaurus* is hardly distinguishable from the first. The oldest Pterodactyle is as thorough and complete as the most recent. Moreover, no contrast can be more remarkable than the appearance of the various species of *Ichthyosaurus* in the marine strata of the chalk period, and the utter blank in reference to any form calculated to throw light on their origin.

[Prof. Haeckel, for the Darwinians, points out that physiologically Friedenthal has shown that the blood of man acts poisonously on and decomposes the blood of the lower Apes and other mammals, but has not that effect on the blood of the Anthropoid Apes. Selenka, again, demonstrated that certain peculiarities in the formation of the placenta deemed to be conclusively human are present in the Anthropoid Apes. Haeckel, indeed, asserts that the descent of man from extinct Tertiary Anthropoid Apes is proved as plainly as the descent of birds from reptiles, or the descent of reptiles from amphibians. The Neanderthal skull and the fossil Ape-man (*Pithecanthropus erectus*) from Java are unhesitatingly believed by Haeckel to be "the missing links."]

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* Cetaceans resemble Ichthyosaurians in non-union of the majority of the ribs and sternum, in the peculiar articulation of the ribs with the vertebræ, in the remarkable sternum itself, in the chevron bones of the caudal region, late union of neural arches and bodies of vertebræ, long symphysis of mandible, in the teeth, and in the absence or rudimentary condition of the pelvis. Palæontology reveals transition forms between Cetacea and Sirenia. *Halitherium*, again, links the Sirenia and hoofed animals.

Undismayed by the difficulties presented by the geological record, Darwin goes on to account for the absence of ancestry to the occasionally complex fossils in the old Silurian rocks by hinting that perhaps we see in the granitic rocks the transformed strata long anterior to the Silurian epoch. Dr. Carpenter is of opinion that an important link is to be found in Eozoön, which he and its discoverers, Sir William Logan and Dr. Dawson, consider to be a gigantic Foraminifer. Careful observation by others, however, negative this view.

It is a well-known fact that a species which has been extinguished never reappears. The evolutionists ask with force—Why, on the hypothesis of independent creation, were the failing species not re-created in those regions so well adapted for their well-being? They assert, for instance, that no part of the world now offers more suitable conditions for Wild Horses than the Pampas and other plains of South America, a fact that is well enough proved by the facility with which they have run wild and multiplied enormously since their introduction by the Spaniards in comparatively recent times. Why, on the principle of original and direct adaptation of species to climate, were they not reproduced? Darwin's hypothesis alone, say they, gives the clue. The chain of direct descent was completely broken by the extinction of the first race of Horses.

In the most distant parts of the earth, again (such as North America, Tierra del Fuego, India, and the Cape of Good Hope), the organic remains in certain beds have a close resemblance to each other. Natural Selection, says Darwin, has caused this by gradually spreading the dominant forms of life throughout the successive strata.

Agassiz states that Darwin's whole chapter on the geological record appears to him as a series of illogical deductions and misrepresentations of the modern results of the science. In vigorous language he portrays the beliefs which Darwin would have us entertain, and adds his view of the real state of the facts, *e.g.*: He (Darwin) would have us believe that each new species originated in consequence of some slight change in those that preceded, when every geological formation teems with types that did not exist before. He would have us believe that animals disappear gradually, when they are as common in the uppermost bed in which they occur as in the lowest or any intermediate bed. Species appear suddenly and disappear suddenly in successive strata. Agassiz also denies that the fossiliferous deposits took place during subsidence, and instances the whole of North America as being formed of beds that were deposited during successive upheavals.

[To-day the evolutionists bring forward a vast amount of evidence from every quarter of the globe in favour of descent with modification in almost every group in the animal kingdom. Nowhere have these views spread with greater acceptance than on the Continent of Europe, and especially in Germany, where Haeckel and Weismann in their several fields in zoology, and Strasburger in botany, have conspicuously laboured. In our own country the work of Huxley, Flower, Avebury, Galton, F. M. Balfour, Lankester, Romanes, Bateson, Weldon, Poulton, and many others have brought to light important facts which are of permanent value irrespective of their theoretical bearings.]

Some most interesting facts are given by Darwin and his supporters in expounding the geographical distribution of plants and animals, with regard to oceanic islands. The absence of terrestrial mammals and batrachians and the presence of bats is held as inexplicable on the theory of creation. Darwin also adverts to the fact that at St. Helena there is reason to believe that the naturalised plants and animals—that is, those imported by man—have nearly exterminated the native productions; and he taunts the defenders of the doctrine of the creation of each separate species in its most appropriate locality by saying that they will have to admit that a sufficient number of the best adapted plants and animals were not created on oceanic islands; for man has unintentionally stocked them from various sources far more perfectly than did Nature. Sir Joseph Hooker, again, observes that no other theory explains so many of the facts connected with the distribution of plants in oceanic islands, of which he specially instances the Canaries, Azores, and St. Helena in the Atlantic, and Kerguelen in the South Indian Ocean.

In the five or six great plans on which the animal kingdom is constructed Darwin saw only the hidden bond of inheritance. Thus he explained the similarity of pattern in the hand of Man, in the flipper of Seal, and in the wing of Bat. It is hopeless to account for these by utility or the doctrine of final causes (Teleology), and Owen admits this. Darwin explained this by the Natural Selection of successive slight modifications, and showed that however much modified there would be no tendency to alter the framework of bones. Why, he asks, should similar bones have been created in the formation of the wing and leg of a Bat, used as they are for such totally different purposes; that a bird like a Thrush (Dipper) should have been created to dive and feed on subaquatic insects? Why should teeth have been created in young calves that never cut the gums, or in Guinea-pigs that shed them before they are born; and that teeth should be present in young Finner Whales when the adult animal is toothless?

On the contrary, with regard to classification his antagonists hold that from the beginning there could have been no community of origin between the several branches of the animal kingdom, since they are founded on different plans of structure, and so with the subordinate groups.

Darwin is charged with denying the existence of design in the material universe. In one chapter he says:—"If our reason bids us admire with enthusiasm a multitude of inimitable contrivances in Nature, this same reason tells us, though we may easily err on both sides, that some contrivances are less perfect. Can we consider the sting of the bee as perfect which, when used against many attacking animals, cannot be withdrawn, owing to its backward serratures, and so inevitably causes the death of the insect by tearing out its viscera?" This passage has been cited in accusing him of sneering at the designs of Providence, and in denying any agency beyond that of a blind chance in the development or perfection of the organs or instincts of created beings. His followers say that the adoption of his theory would leave the doctrines of final causes, utility, and special design just where they were before.

Darwin made so much of the resemblance amongst the young of vertebrate animals that he thought it probable all the members in the four great classes, *viz.* Mammals, Birds, Reptiles, and Fishes, were the modified descendants of one ancient progenitor, which was furnished in its adult state with branchiæ, had a swim-bladder, four simple limbs, and a long tail fitted for aquatic life.

In regard to the resemblances between young animals, Agassiz states that the embryo of the American Freshwater Turtle and the embryo of the Snapping Turtle resemble one another far more than the different species of the former in their adult state; a young Snake resembles a young Turtle or a young bird much more than any two species of Snakes resemble one another; and yet not a single fact can be adduced to show that any one egg of an animal has ever produced an individual of any species but its own.

Dr. Asa Gray sums up that Darwin's theory, leaving man out of the question, very well accords with the great facts of zoology and comparative anatomy, or goes far to explain both the physiological and structural gradations and relations between the two kingdoms, and the arrangement of all their forms in groups subordinate to groups, all within a few great types; that it reads the riddle of undeveloped organs and of structural conformity, of which no other theory has offered a scientific explanation, and supplies a ground for harmonizing the two fundamendal ideas which naturalists and philosophers conceive to have ruled the organic world, though they could not reconcile them, viz. *adaptation to purpose* and to *the conditions of existence*, and the Unity of Type. While the theory seems inadequate to the task it so boldly assumes, it must be remembered that the more important objections relate to questions on which we are confessedly ignorant. Those who imagine it can be easily refuted and cast aside must, he says, have imperfect or very prejudiced conceptions of the facts concerned and of the questions at issue.

The opponents of the Theory, on the other hand, while giving credit to Mr. Darwin for his great candour, logical skill, and his extensive knowledge of Natural History, say that he has not proved his case, *viz.* that species are mutable. One of them concludes with the statement which he says has never been impugned: "Classification is the work of science, but species the work of Nature."

[Such, then, is a brief outline of the *hypothesis* of Evolution as expounded by Mr. Darwin, and which has shed a new light on biological researches, and, on the other hand, of some of the antagonistic views. Evolution, as Prof. Allman tersely puts it, depends on two admitted faculties of living beings—*heredity*, or transmission of character from parent to offspring, and *adaptivity*, or the capacity of having these characters more or less modified.

This theory has met with wide acceptance, and is held by many to suggest a more satisfactory explanation of the main facts in zoology, botany, and geology than any other. Moreover, Darwin has enabled observers to extend the effect of known causes to cases in which they have not been suspected, and has given a fresh impulse to studies of the structure, development, and relationship of animals. The meaning of this will be more evident by reference to one or two examples. Thus in the Lower Eocene of North America is a small five-toed animal (*Phenacodus*), from which the ancestry of the Horse can be traced. In the same formation is another—*Eohippus*—of the size of a Fox, with four well-developed toes and a rudimentary fifth in front, and three toes behind. In the next higher division of the Eocene another —*Orohippus* (*Hyracotherium*)—of similar size appears, with four toes in front and three behind. Then a third (*Mesohippus*), the size of a Sheep, presents itself in the subsequent formation (Miocene), with three functional toes and the splint of another in front, and three behind. In a somewhat higher horizon *Miohippus* (*Onchitherium*) occurs with a similar structure, except that the splint-bone is reduced in size. *Protohippus* (*Hipparion*), of the size of a Donkey, again appears in the Pliocene above, and exhibits three toes in front and three behind. Further upward comes *Pliohippus*, a near ally of the Horse, with only a single functional toe to each foot, but differing in the structure of the teeth. Lastly, the true Horse is found just above this horizon, and the series is complete. It appears therefore reasonable to conclude that this series of gradations is best explained by the theory of Evolution. In the same way Dr. Smith Woodward traces upward from small ancestors the gigantic Ground-Sloths and Armadillos of South America, in which the land area may have been more extensive—even perhaps connected with a great Antarctic continent which included Australia—a hypothesis supposed to be favoured by the finding of the large, extinct Horned Tortoise both in Queensland and Patagonia. Moreover, "strange Ungulates (Toxodontia, Typotheria, and Lipoterna), which in some respects resembled rodents, can also be traced in the same region from small progenitors to gigantic representatives. Some of the Lipoterna were one-toed, and were curious mimics of the Horse, of the northern hemisphere"

Further, the riddle of the occurrence of gills in the young of the Land Salamander of the Alps, which never enter the water and of course never use their temporary gills, as also the presence of gill-clefts in the young of the higher vertebrates, is surely fairly read by the supposition or theory that such have probably had aquatic ancestors.

The Zoëa-stage, again, in the young of the Shore-Crab points to a long-tailed progenitor; just as the birth of the young Flounder in a shape similar to that of a young Cod (and having an eye on each side) indicates theoretically a common ancestry, the turning of the eye to the other (coloured or upper) side being a subsequent adaptation to suit its ground-haunting habits.

Mr. Darwin and the evolutionists may fairly claim that their hypothesis embraces a greater number of phenomena and suggests a more satisfactory explanation of them than any other theory yet propounded. This much even those reared in the schools of Goodsir and Oken, Owen and St. Hilaire, must frankly admit, though, as shown by Prof. Cleland of Glasgow, they must, apart from all external influences, supplement the theory by a definite evolution of organization dependent on a definite cause. While the evolutionary theory explains the order and fitness of the organic beings on the surface of the earth, it does not fully explain the vital properties, for instance, of living protoplasm, *viz.* the *heredity* and *adaptivity* of Prof. Allman, notwithstanding all the labours of Weismann and Semon. Haeckel, however, holds that all living plasm has a psychic life, but that the higher psychic functions, particularly the phenomena of consciousness, only appear gradually in the higher animals.

Prof. Francis Darwin, again, insists that the dim beginnings of habit or unconscious memory in the movements of plants and animals must have a place in morphology, and in his able and ingenious Presidential Address to the British Association he concludes by stating that the mnemic hypothesis of Evolution makes the positive value of Natural Selection (which has been taunted with being a negative power) more obvious. There can be no doubt that memory goes far down in the animal scale.

Special difficulties present themselves to the investigators of complex groups, for example, the Polychæte Annelids and Starfishes. In the former it is hard to decipher the ways of natural or other selection in the marvellous general variety, yet individual fixity of structure in the bristles and hooks. For instance, in such forms as *Harmothoë*, not only do the bristles in front differ from those in the rear, but the dorsal and ventral divisions of each foot present a characteristic variation from the upper to the lower edge of each fascicle. Moreover, every member of each species shows precisely the same variation anteriorly and posteriorly, and from the dorsal to the ventral border of each division of the foot. Further, a single bristle or hook of almost every species of annelid retains its characteristic structure from generation to generation, so as to be a key to the species. Nevertheless, it occasionally happens that two forms come so near each other that it is hard to decide as to specific identity or difference.

In regard to the latter (Echinoderms), the younger Agassiz, confining his remarks for the moment to the Sea-urchins, stands aghast in calculating the possible combinations that can be produced by the modifications of ten of the most characteristic features. He is of opinion that the making of a genealogical tree is a hopeless task.

In conclusion, while difficulties in detail, the imperfection of the geological record, and perhaps the chase of a phantom which never can be seized, prevent the complete realization of the Evolutionary theory, there can be no doubt that it has given a great impetus to the study of the Natural Sciences. For this science is mainly indebted to the patient industry, the resolute endurance of physical delicacy, the philosophic caution, and the powerful intellect of Charles Darwin, who long before the appearance of the 'Origin of Species' was honoured and esteemed for various researches, including his works on the Cirripedes, on Coral Reefs, and on the Voyage of the 'Beagle.' His works bearing on Evolution since that date (1859) have spread his fame over the whole civilized world, and as a naturalist made his name imperishable.]

ROUGH NOTES ON DERBYSHIRE NATURAL HISTORY, 1906–1908.

By the Rev. Francis C. R. Jourdain, M.A., M.B.O.U., &c.

(Continued from vol. x. p. 142.)

Of late years I have contributed a series of Ornithological Notes to the 'Journal of the Derbyshire Archæological and Natural History Society,' and the present paper therefore contains a *résumé* of the more important occurrences therein recorded during the past three years, in addition to several records which have hitherto been overlooked.

Mammalia.

Lesser Shrew, *Sorex minutus*, L.—One found in a wood near Repton by Mr. T. Rumney in 1908. It has already been recorded from this district by Mr. Storer, but is evidently not common.

Polecat, *Putorius putorius* (L.).—Mr. Rumney also found the remains of what appears to have been a Polecat near Repton. The last occurrence of this species in an undoubtedly wild state was at Bradley, near Ashburne, in 1900.

Badger, *Meles meles* (L.). — On June 13th, 1907, I saw two half-grown Badgers at Osmaston, which had been taken from an earth in Shirley Park. Two were dug out of an earth at Sutton-on-the-Hill on Jan. 22nd, 1908. The male weighed twenty-six pounds.

Otter, *Lutra lutra* (L.).—A female, forty-four inches long, was trapped on the Dove, near Okeover, towards the end of January, 1907.

Aves.

Song-Thrush, *Turdus musicus*, L. — A nest with the unusually large number of six eggs was found at Clifton on June 3rd, 1906.

Blackbird, *T. merula*, L. — A remarkably early nest in a shrubbery at Mapleton contained young birds on March 6th, 1906. Clutches of six are not nearly so rare with this species as with the Thrush. Two were reported to me in 1906, one from Egginton and one from Clifton.

Stonechat, *Pratincola rubicola* (L.). — A nest with five eggs, found by Mr. G. Pullen late in the summer of 1907, is the only recent record of the breeding of this species in the county.

Nightingale, *Daulias luscinia* (L.). — One reported by Messrs. R. Hall and W. Statham as singing for several nights at the end of April, 1907, in Matlock Dale. It then disappeared, but one was heard a few days later at Duffield. Last heard on May 13th. Mr. Walton also notes the occurrence of this bird near Derby in 1908 ('British Birds,' ii. p. 66).

Common Whitethroat, *Sylvia communis*, Lath.—On May 29th, 1907, I came across a nest with six eggs, the only one I have ever seen in Derbyshire, where the clutch varies from four to five as a rule.

Chiffchaff, *Phylloscopus collybita* (Vieill.). — A single bird was noticed by the River Dove, near Ashburne, on March 10th, 1906, an early date even for this hardy little bird. Of late years it has become quite scarce in the south-west of the county, except in one or two favoured spots.

Reed-Warbler, *Acrocephalus streperus* (Vieill.).—The usual clutch of this species in the Trent Valley consists of four eggs, and sets of five are quite unusual, so that I was the more surprised to find a nest with six eggs in a small bush overhanging Sudbury Pond on June 20th, 1907.

Grasshopper-Warbler, *Locustella nævia* (Bodd.).—Mr. F. H. Sikes found two nests of this somewhat erratic visitor in 1907, one near Rocester, and the other near Beeston Tor, in the Manifold Valley. It is strange how this species varies in numbers from year to year, but on the whole it seems to be less numerous than ten years ago.

Tree-Pipit, *Anthus trivialis* (L.). — On May 28th, 1907, I found a nest with five pale blue eggs, quite unmarked, and not unlike those of the Wheatear, but the bird was not on. On June 2nd I was astonished to find a Tree-Pipit sitting on the nest! Mr. D. Welburn has a clutch in which one or two of the eggs approach this set in colour, but I do not know of any other instance of a clutch of unmarked blue eggs being found in England, although I believe a similar set has been once met with in Denmark (1898).

Great Grey Shrike, *Lanius excubitor*, L.—On Feb. 1st, 1907, I had a good view of a Great Grey Shrike, which got up from a hedgerow in front of us while motoring near Bradbourne. Its flight was weak, and it seemed unable to gain upon the car, and finally turned aside to some isolated thorn-bushes in a field, but would not allow itself to be approached again.

Red-backed Shrike, *L. collurio*, L.—Mr. T. Rumney reports a pair as breeding near Repton in 1908. They have now quite ceased to nest on the hillsides near the entrance to Dovedale.

Pied Flycatcher, *Muscicapa atricapilla*, L.—A male, on migration, seen by me between Clifton and Norbury on May 1st, 1908. The only other bird of this species I have seen in this district was also a cock, at Ashburne, on May 14th, 1887, but it is occasionally noticed on passage both in the Dove and Derwent Valleys. Probably the inconspicuous plumage of the hen causes it to be overlooked.

House-Martin, *Chelidon urbica* (L.).—Several House-Martins' nests may be seen annually, built on the beams *inside* an open shed, and underneath the roofing, instead of on an outside wall, as is usually the case, at the 'Dog and Partridge Hotel,' Thorpe. Unlike the Swallows' nests in similar sites, the entrance of the nest is at the side, and the nest is not open at the top.

Greenfinch, *Chloris chloris* (L.).—A nest with the unusually large number of seven eggs was found in a hedgerow at Ashburne on June 9th, 1906.

Crossbill, *Loxia curvirostra* (L.).—A flock visited the Ashburne district in the early spring of 1904, and two were shot at Yeldersley on Feb. 24th and 26th.

Swift, *Apus apus*, L.—In 1908 the main body of Swifts left the Ashburne district on Aug. 9th–10th, but on Aug. 25th a party of eight birds was noticed by Mr. J. Henderson at Mapleton, and at intervals three or four birds were constantly seen in the Dove Valley till Sept. 1st, when only a single bird was noticed, as was also the case on Sept. 4th and 5th. On Sept. 14th Mr. J. Henderson saw one at Mapleton in the morning, and both he and I distinctly saw another (or the same bird) at Ashburne in the afternoon of the same day. Previous latest records:—Sept. 1st, 1885; Sept. 4th, 1887 (one); and Sept. 3rd, 1905 (one).

NIGHTJAR, *Caprimulgus europæus*, L. — Mr. G. Pullen found these birds breeding on Breadsall Moor in 1906 and 1907, and Mr. C. H. Wells found a nest with two eggs in a fir-wood near Ambergate on June 8th, 1908.

CUCKOO, *Cuculus canorus*, L.—Mr. T. Rumney informs me that a Cuckoo's egg was found in a Willow-Warbler's nest at Repton in 1908. Though not an uncommon foster-parent, I have no previous record of this species for the county.

TAWNY OWL, *Syrnium aluco* (L.). — Mr. C. H. Wells found a Tawny Owl incubating three eggs on a ledge of rocky cliff in Dovedale on April 17th, 1908. One of the eggs was not covered, and showed up, white and conspicuous. A second nest found by Mr. Wells not far from Ambergate was in a similar situation, but contained only one egg on April 19th, though three more were subsequently laid. All the other nests found in this district (where the Tawny Owl is by no means uncommon) have been placed either in holes of trees or on rude platforms naturally formed by the accumulation of rubbish between boughs, or in old Rooks' nests. Four eggs is also an unusually large clutch for a Derbyshire bird, but a nest found at Mapleton on March 26th, 1908, also contained this number.

LITTLE OWL, *Athene noctua* (Scop.). — One clearly identified by Messrs. H. G. and A. G. Tomlinson while sitting in a privet-bush in a wood close to Mr. Tomlinson's house at Burton-on-Trent on Nov. 5th, 1906.

ROUGH-LEGGED BUZZARD, *Buteo lagopus* (Gm.). — One seen at Ashford-in-the-Water, Feb. 13th, 1907 (W. Boulsover).

HONEY-BUZZARD, *Pernis apivorus* (L.). — A considerable immigration of these fine birds must have taken place in the autumn of 1908. A "Golden Eagle" was reported in the local papers to have been seen near Dovedale on Aug. 22nd, while on Sept. 2nd Mr. J. Henderson, Jun., caught a glimpse of two Buzzards (sp. ?) soaring near Ashburne, and on Sept. 10th a very dark Honey-Buzzard was received for preservation at Ashburne, which had been shot at Osmaston, probably on the previous day. Numerous other specimens have been recorded in 'The Zoologist,' 'British Birds,' 'The Naturalist,' &c., as having been shot in various parts of England, Wales, and Ireland.

HOBBY, *Falco subbuteo*, L. — One shot at Sudbury in June, 1906, by the keeper.

PEREGRINE FALCON, *F. peregrinus*, Tunst. — One reported as having been shot at Biggin by Mr. Bosley on Aug. 31st, 1901. Another seen by Mr. J. Henderson near Newhaven on Sept. 30th, 1908.

MERLIN, *F. æsalon*, Tunst.—Three nests of this beautiful little Falcon were taken by keepers on the North Derbyshire moors in the spring of 1908. It is wonderful that this bird should still exist in spite of the unremitting persecution to which it is subjected.

WILD GEESE, *Anser* sp. ?. — A "gaggle" of eighteen Wild Geese was seen by Mr. G. Pullen on Jan. 12th, 1908, but the weather was too misty to identify the species. On Dec. 18th another flock passed over Hanging Bridge in V-formation, while during the previous week a smaller party of about eight birds alighted in the meadows by the River Dove. These were certainly "Grey" Geese of some species.

[EGYPTIAN GOOSE, *Chenalopex ægyptica*. — One shot on a pool near Staveley in the spring of 1906 (Canon Molineux).]

WHOOPER, *Cygnus musicus*, Bechst.—Three seen near the River Dove (Hanging Bridge) on March 28th, 1906, and five seen flying down the Henmore Valley on April 2nd, two of which alighted at Birdsgrove, while the other three went on to Calwich. Mr. Henderson and I both identified these birds as Whoopers.

BEWICK'S SWAN, *C. bewicki*, Yarr. — Three passed close overhead on Feb. 6th, 1907, flying up the Dove Valley, between Clifton and Mayfield.

POCHARD, *Fuligula ferina* (L.). — A fine drake, strong on the wing, seen on the ponds at Osmaston, on June 13th, 1906. It is quite possible that this bird may have been breeding at the time. Mr. Storrs-Fox records two Pochards seen on Ashford Lake, near Bakewell, on Jan. 27th, 1907. He had only once before seen a Pochard here. On March 27th, 1908, I saw two couple of these Ducks on the lake at Calwich Abbey.

TUFTED DUCK, *F. fuligula* (L.). — On one of the islets at Osmaston I flushed a Tufted Duck from a nest, or rather heap of eggs, which were obviously the produce of three or more birds. Altogether there were twenty-eight eggs in the nest, but the bulk of them were quite cold.

COMMON SCOTER, *Œdemia nigra* (L.). — One seen on the wing near Ashburne by Mr. G. M. Bond on Jan. 19th, 1906. This may have been a pricked bird, for a "Black Duck," unable to fly, was reported to me from a stream in the neighbourhood. A drake had been shot within a mile of the spot on Nov. 4th, 1904.

PALLAS'S SAND GROUSE, *Syrrhaptes paradoxus* (Pall.). — I find that the two examples of this species which are stated in Whitlock's 'Birds of Derbyshire,' p. 184, to have been killed in July, 1889, were really shot in June, 1888.

QUAIL, *Coturnix coturnix* (L.).—One caught at Chaddesden on June 20th, 1908 (G. Pullen).

TURNSTONE, *Strepsilas interpres* (L.). — This is an addition to our county list, as no definite occurrence has hitherto been recorded, although there is little doubt that it has occurred in the Trent Valley. Three were killed during the night of June 1st, 1906, near Longcliffe. One of these was sent to Mr. Adsetts for preservation, and has now passed into the Calke Abbey collection.

OYSTERCATCHER, *Hæmatopus ostralegus*, L. — One shot on March 16th, 1900, at Parwich by Mr. Naylor.

GREY PHALAROPE, *Phalaropus fulicarius* (L.).—One shot some time between Dec. 15th and 17th, 1906, on a small pond not far from Winster, by Mr. G. Wood. It is now in the possession of the Rev. J. R. Ashworth, of Hartington, and is the eighth specimen definitely recorded for the county.

GREEN SANDPIPER, *Totanus ochropus* (L.). — One flushed from the side of the upper pond at Osmaston on July 10th, 1908.

WHIMBREL, *Numenius phæopus* (L.).—One shot at Parwich on May 19th, 1906, by a keeper named Brownlee.

BLACK TERN, *Hydrochelidon nigra* (L.). — One shot at Aston Hall, and sent to Mr. Adsetts for preservation on Aug. 27th, 1908.

BLACK-HEADED GULL, *Larus ridibundus*, L. — Two seen at Bakewell by Mr. W. Boulsover on May 23rd, 1907, and nine on the following day on Calton pastures (a late date for this species). Mr. A. Cox also records this bird in winter plumage from Spondon in March, 1908.

HERRING-GULL, *L. argentatus*, Gmel.—One seen at Derby on April 13th, 1908 (A. Cox).

LESSER BLACK-BACKED GULL, *L. fuscus*, L.—A flock of fifteen flew over Clifton on Aug. 11th, 1907, and, curiously enough, on Aug. 11th, 1908, about twelve were again seen near Clifton, and on the following day I again saw eight large Gulls in the distance, which were either this or the preceding species.

LITTLE AUK, *Mergulus alle* (L.).—One was picked up dead on the ice at Sudbury Pond on Nov. 29th, 1904, by Mr. J. Bottrell, who has the bird still in his possession.

GREAT CRESTED GREBE, *Podicipes cristatus* (L.). — Two pairs of these fine birds breed annually on the ponds at Osmaston, and in 1907 a pair bred for the first time on the pond at Yeldersley. A pair or two also nest at Sudbury.

MANX SHEARWATER, *Puffinus anglorum* (Temm.). — One was captured alive in a bakehouse at Alvaston, near Derby, after the gale of Sept. 8th, 1908, where it had taken refuge. This is the thirteenth record of this species for the county, and it is interesting to note that in almost every case of which we have details the bird was obtained on the September migration.

NOTES AND QUERIES.

AVES.

The Reported Great Bustard in Yorkshire.—In 'The Zoologist' (*ante*, p. 78) it is stated by Mr. Morley, under the head of "Ornithological Notes from Scarborough," that a *Great Bustard* had been shot near Cloughton last December. Some of the feathers of the bird were sent to me, and it was easy to see that it had been no Bustard but a female *Silver Pheasant*. Although I had no doubt myself on the subject, I sent on the feathers to the Natural History Museum, where my opinion was confirmed. I saw a letter from Mr. Bennett, in which he spoke of the legs and feet and the space round the eye being of a bright red.—W. H. St. Quintin (Scampston Hall, Rillington, York).

Nottinghamshire Bird Notes. — The following recent occurrences in the county of Nottingham are of sufficient interest to be placed on record:—

Great Spotted Woodpecker (*Dendrocopus major*).—One specimen at Calverton, March, 1908.

Tawny Owl (*Syrnium aluco*). — One at Eastwood, December, 1907.

Little Owl (*Athene noctua*).—One at Widmerpool, Dec. 10th, March, 1907; one in the Trent meadows opposite Clifton Grove, 14th, 1908.

Rough-legged Buzzard (*Buteo lagopus*). — One shot near Bingham, 1907.

Pink-footed Goose (*Anser brachyrhynchus*).—A pair were shot in the meadows by the Trent at Gunthorpe on Dec. 26th, 1907. There is only one previous record of the occurrence of this rare bird in the county.

Shoveler Duck (*Spatula clypeata*).—One on the pool near Trent Bridge, Nottingham, August, 1908.

Ruff (*Machetes pugnax*).—One shot at Colwick, December, 1907.

Bar-tailed Godwit (*Limosa lapponica*).—One at Hoveringham, on the Trent, Jan. 2nd, 1909.

All these specimens have been acquired for the local collection of birds in the Natural History Museum at University College, Nottingham.—J. W. Carr (University College, Nottingham).

PISCES.

Trachinotus ovatus an Enemy to the Queensland Oyster Fisheries. One of the Blue Books recently received from the Colony of Queensland gives particulars of the Oyster fisheries in Moreton Bay, which supply the city of Brisbane. The cultivation of the Oyster-banks, by thinning out the tops of the reefs and by culling out clumps, is proceeding apace. The banks have been much benefited by the regular rains which have visited Queensland and the bays and estuaries. The fishing in Moreton Bay during the year has been highly satisfactory. Mullet is to be got at all times in the bays, rivers, and inlets, while from Moreton Bay large supplies of Whiting, Taylor, Gar, Bream, and other kinds have been drawn. Owing to the increasing number of Sharks infesting the Bay, it is suggested that a bonus be given per gallon on Shark-oil, and a bonus per ton on fertilizer made from the carcases. Dugong fishing has been going on briskly. Fish and Prawns have been very plentiful off the coast, and the Queensland authorities are hopeful that the representatives of the Scottish fishermen who recently visited Australia, and who are negotiating for an Australian fishing centre, will settle on the Queensland coast.

The Oyster fisheries have been attacked lately by " a peculiar kind of fish, which works in droves, and crushes the shell of the young Oysters with little apparent effort." The Report continues :—" These fish I have seen working, but they are very shy, and it seems almost impossible to catch them. In appearance they resemble the ' big green Toad,' with similar jaws, and run to as much as three feet six inches in length, with a peculiar feathery top to the tail; they work in rows, and will cut a track through a bank of young Oysters, leaving the white broken shell looking as if a steam-roller had passed over it To prevent this the lessee went to the expense of fencing in about ninety acres with galvanized wire-netting, which plan, he informs me, has proved very successful." A specimen of this fish has at length been captured, and has been found to be a large sample of the species known as *Trachinotus ovatus*, or, to coin a vernacular name, the " Snub-nosed Swallow-tail." The genus inhabits the inter-tropical seas of both hemispheres.—The London Correspondent of the ' North Queensland Herald ' (Bassishaw House, Basinghall Street, E.C.).

[The food of *Trachinotus carolinus* "seems to consist very largely of small bivalve shells," &c. (Investig. Aquat. Resources and Fisheries of Porto Rico; Washington, 1900, p. 140). In Texan waters "the Oyster has but few enemies, the Drumfish* being the only one dreaded" (Proc. Nat. Fish. Congr. Florida, 1898, p. 314).—Ed.]

OBITUARY.

Charles Berry.

Although little known, save by West of Scotland naturalists and geologists, Charles Berry, who died Feb. 1st, 1909, is well worthy of some brief commemoration in the pages of 'The Zoologist.' Destined to spend fifty-three years of his life in the small and secluded village of Lendalfoot on the Ayrshire coast, engaged in the arduous occupation of a sea-fisherman, he "found himself" in quiet, patient, and continuous natural history observations and pursuits, winning a well-deserved reputation for first-hand local knowledge and accuracy. Perhaps the proximity to Lendalfoot of the great bird-station of Ails Craig had some effect in making ornithology his favourite pursuit. His information was always at the disposal of inquirers, and year after year his observations and returns were amongst the most valuable included in Mr. John Paterson's "Reports on Scottish Ornithology," published in the 'Annals of Scottish Natural History.'

So far as writing is concerned, he was, however, of the "mute, inglorious" class, and it is only now, at the time of his death, that ornithologists in general have the opportunity of learning something of his work. In the 'Glasgow Naturalist' (the new journal of the Natural History Society of Glasgow, issued last month—February), an article by him on the "Birds of Lendalfoot" appears (pp. 5–23), the only writing of his ever published, I believe. It is one of the most remarkable examples of purely personal and strictly local ornithological work ever done, confined as it is to a four-mile radius and the adjoining waters, and, as the writer says, "I thought it better not to add a single bird but those I have myself seen and in most cases handled." In these circumstances, to be able to enumerate one hundred and sixty-two species, ninety-five of which nest (including the Ailsa Craig records), shows that Mr. Berry came very near making the utmost possible out of his opportunities. Unfortunately he did not live to see his work in print, but it has secured his position and repute high amongst Scottish local ornithologists.—H. B. W.

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* *Pogonias cromis?*.

NOTICES OF NEW BOOKS.

A Treatise on Zoology. Edited by Sir Ray Lankester, M.A., LL.D., F.R.S., &c. Part I. Introduction and Protozoa. First Fascicle by S. J. Hickson, F.R.S., J. J. Lister, F.R.S., F. W. Gamble, D.Sc., &c., A. Willey, M.A., D.Sc., &c., H. M. Woodcock, D.Sc., the late W. F. R. Weldon, F.R.S., and E. Ray Lankester, K.C.B., &c.

This volume contains the first fascicle of part i., and is just published; the second fascicle appeared in 1903, and was then reviewed in these pages. The two fascicles fully bear out the claim made for them by their Editor, that they "give a more complete account of the Protozoa than is to be found in any similar work hitherto published."

To the ordinary biologist and evolutionist this volume is of the greatest importance, for in the Introduction Sir Ray Lankester discusses "The Dividing-line between Plants and Animals." For the main difference we are directed to the fact that "animals are unable to assimilate—that is, to utilise as food the simpler chemical compounds of carbon or of nitrogen. They can only take their nitrogen from food which is in the elaborate form of combination which is called a proteid; they can only take their carbon either from a proteid or from a carbohydrate or a hydrocarbon." "Plants, on the contrary, are (with certain exceptions) able to take up as food the compounds of carbon and of nitrogen, which may be called the stable or resting condition of those elements—namely, the simple oxide of carbon—carbonic acid gas, and the simple compound of nitrogen and hydrogen which is called ammonia, or the oxide of nitrogen which forms nitrates." "The obvious and predominant difference in the make and habit of plants as compared with animals is thus connected with the very great and definite difference in the nature of the food of the two groups." The debatable ground is limited to the chlorophyll-forming Flagellata, including some for which "it is not possible to draw a sharp line and assign them definitely either to the Animal or to the Plant series." This question, which lies on the very bedrock of biology, is not only very fully discussed, but is enunciated by an authority whose judgment on such questions should be *nulli secundus.*

Our space precludes reference to the many separate contributions by the different authors who have produced this volume, but sometimes a particular subject is focussed in biological consideration, and eventually filters through the press to the "man in the street." Such is the topic of minute animal parasites which are admittedly negotiators in disease, and readers who would desire to have an adequate idea of this terrible animal organization—worse than the army and navy of a competitive nation, more to be feared and less easily conquered—may be directed to Dr. Woodcock's chapter on "The Haemoflagellates or Trypanosomes, to which is attached [a gift to Zoologists] a List of known (Natural) Hosts of Trypanosomes and Allied Forms." This, with the literature relating to these creatures, brings the subject up to date, and is a timely and valuable contribution.

The Life of Philibert Commerson, D.M., Naturaliste du Roi; an Old-World Story of French Travel and Science in the Days of Linnæus. By the late Capt. S. Pasfield Oliver, R.A., and edited by G. F. Scott Elliot, F.L.S., &c. John Murray.

Capt. Oliver did not live to publish his book; he, however, before his death handed over all his material to Mr. Scott Elliot, who has worthily completed the task, and taken us back to the early days of modern zoology.

Commerson was a botanist first and an ichthyologist to a somewhat less degree, while his life's work centres round the well-remembered voyage of De Bougainville, whom he accompanied as naturalist, though in the second vessel of the expedition. He died at the age of forty-six years, on the Island of Bourbon, thus not returning to France, where he was assured of much honour, as eight days after his death (1773) he was, in Paris, elected a member of the Academy of France by a unanimous vote in a full assembly, and at the same time the Cordon of the Order of St. Michael was conferred upon him, appreciations of which he was destined to remain in ignorance. In these old days before the advent of steam-power, much more was found to interest a naturalist on board a sailing-vessel—with the greater expanse of ocean covered by her erratic wind-dependent course, and the opportunities afforded by calms—than is experienced nowadays on the straight high roads of the ever-speeding liners; and those of us who have made an early voyage under sail can well realize the altered conditions which so greatly limit the observations of a travelling zoologist. A curious proposition was enunciated by Commerson in relation to the shoals of *Scomber* which followed his vessel: "The surface of the sea, exposed to the glare and fierce heat of the tropical sun, becomes disagreeable to them, so they seek the neighbourhood of a high coast-line, where, under lofty rocks and promontories, they can play and gambol in full shelter." This suggested the shelter they find on the shady side of vessels, and may thus account for much of their presence in some latitudes.

The results of Commerson's collecting on this voyage were prodigious; the work he loved gave him no rest, wore him out, and practically caused his early death. His achievements in botany are well known to all followers of that science, and in that he excelled. As regards his other discoveries, we may use the valuation of Mr. Scott Elliot:—"As a geologist, the value of his mineralogical specimens and his account of the Bourbon volcanoes have been justly acknowledged by Bory de Saint-Vincent. M. Duméril discovered his collections and drawings of fishes still unpacked in an attic of Buffon's house. These form a very large and valuable proportion of Lacépède's 'Histoire Naturelle' (published in 1801). His manuscripts on the mammalia of Madagascar and the Mascarenes were unearthed in the library of M. Hermans at Strasbourg, and freely used by Cuvier, who also generously acknowledges his indebtedness."

Commerson was reared in a country and in an age when dreams of a noble savage and the freedom and moral excellence of primitive races were being freely propagated. His estimate of his "dear Tahitians" and his argument as to "What constitutes robbery?" may probably meet the views of some extreme thinkers of to-day. He was a born naturalist and a self-made martyr to natural science; his economical views would have gained the approval of Rousseau, but his great contributions to botany and zoology should not, and never will be, forgotten while those sciences are studied, and the thanks of all are due to Mr. Scott Elliot for giving us an excellent sketch of the naturalist and his environment.

Catalogue of the Noctuidæ in the Collection of the British Museum. By Sir George F. Hampson, Bart. Published by the Trustees of the British Museum.

This is vol. vii. of the author's great monograph of the moths of the world, and is another instalment to a knowledge of the *Noctuidæ*, and relates to the large subfamily *Acronyctinæ*, which comprises some three thousand species belonging to over three hundred genera, and are calculated to occupy three volumes of the Catalogue. As we are told that the manuscript dealing with the remainder of the subfamily is ready for press and will be issued in two volumes probably in 1909, we must congratulate Sir George Hampson on his energy and determination, for to produce a single volume is no light task, the present one occupying no fewer than seven hundred and nine pages.

With the large amount of material at hand, the habitats or localization of the species is most extensive, so that we have here the facts for the study of the geographical distribution of the *Noctuidæ*. To those writers who conclude that a fairly wide separation in latitude and longitude must also denote specific difference, the tabulated distribution of some of these moths will appear as a disturbing element for consideration.

Thus, to take a single species, *Perigea capensis*: this insect is described as common to the Ethiopian region, including Madagascar and Mauritius; by Egypt and Sokotra distributed throughout British India and the Malay Archipelago; recorded from the Solomon, Marshall, and Fiji Islands; and found in Queensland. In the synonymy we are not surprised to find that it has been described under different names no fewer than fourteen times! And this is not a unique example to be found in these pages. We also have a thorough generic revision, with keys to the genera, and also to the species when the genera are sufficiently extensive to require that aid, with numerous blocks in the text to illustrate the structural characters and

general appearance, accompanied by a further instalment of coloured plates, which now reach the respectable figure of one hundred and twenty-two. Sir G. Hampson is writing a monumental series of volumes the contents of which will take long to grow old.

EDITORIAL GLEANINGS.

THE 'Evening News' recently sent a special correspondent to Darwin's village, and from his report we extract the following statement that should be preserved:—I had been told to look up Mr. John Lewis in the village, who used to do all the carpentry and joining work for the house. I found him in his cottage, a short hale man with white hair and beard and a rare smile. "I hear you are quite an old friend of Mr. Darwin's." He straightened himself at once. "I went to him sixty years ago as a page for two years. I was fifteen then. Now I am seventy-five. I made Mr. Darwin's coffin" (this with a look of important affairs). "They buried him in Westminster Abbey, but he always wanted to lie here, and I don't think he'd have liked it. I made his coffin just as he wanted it; all rough, just as it left the bench, no polish, no nothin'. But when they agreed to send him to Westminster they had to get another undertaker. And my coffin wasn't wanted, and they sent it back. This other one you could see to shave in. I kept the coffin by me a long time. I thought I might sell it. I got several bids of fifty poun', but didn't part with it. One gentleman I told about it said, 'Ask two hundred, you'll get it easy.' But I never did. I can show you letters from America and Germany about it." "What became of the coffin?" I asked, "I sold it for ten pounds to a young chap that kept a beerhouse out at Farnborough. He's dead since then." I gathered that the coffin is still in the "beerhouse." "Darwin laid in that coffin thirty-one and a half hours exactly. I put him in myself."—*Evening News*, Feb. 12th, 1909.

A REMARKABLE case claimed the attention of the medical staff at the West Norfolk and Lynn Hospital on Sunday. A twelve-months'-old infant named West, whose parents reside in Attoe's Yard, Norfolk Street, Lynn, was received into the institution suffering from severe wounds, as a result of being attacked by rats as it lay in bed. Portions of the child's feet were eaten away by the animals, and the infant was also bitten about the face, arms, and body.—*East Anglian Daily Times*, Jan. 26th, 1909.

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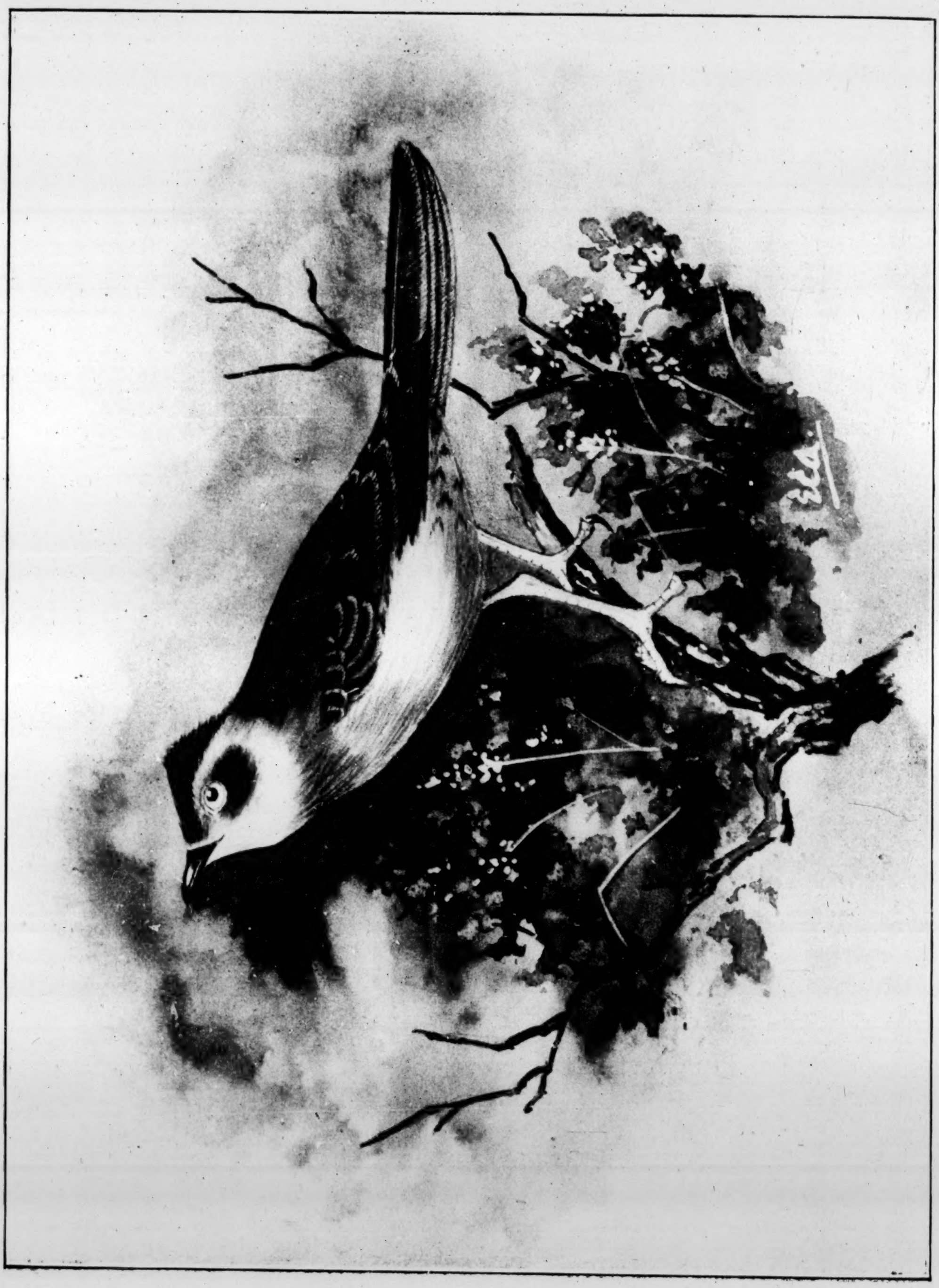

IMMATURE BARRED WARBLER (*Sylvia nisoria*).